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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
BAND, MICHAEL A	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/820,896	NEWCOMB ET AL.	
	Examiner	Art Unit	
	MICHAEL BAND	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 June 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-13,15-19,21 and 22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3, 5-13, 15-19, and 21-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/10/2008 has been entered.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, a bearing closest to a midpoint between a first end and a second end must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate

changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-3, 5-13, 15-19, and 21-22 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1, 13, 16, and 19 have the limitation of "a closest bearing". There is no support for this limitation in the specification.

5. Claim 19 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one

skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 19 has the limitation a midpoint, a first end, and a second end, where a closest bearing is close to a midpoint between said first end and second end of the rotatable target. There is no support for this in the specification or drawings.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

7. Claims 1, 3, 5, 9-10, 12-13, and 21-22 are rejected under 35 U.S.C. 102(a) as being anticipated by Wurczinger (WO 03080891), equivalent to Wurczinger (USPGPub 2005/0178662).

With respect to claims 1, 13, and 21-22, Wurczinger discloses a system for coating a substrate (p. 1, para 2) comprising a vacuum chamber (p. 1, para 0019; fig. 2, [1]), a rotatable tube positioned inside the vacuum chamber (fig. 2, [1]-[2]; p. 1, para 0017), a shaft connect to the rotatable tube (fig. 3, [2]-[3]); a bearing positioned outside the vacuum chamber (fig. 2, [16]-[17]); a seal (fig. 2, [13]) positioned between the bearings (fig. 2, [16]-[17]) and the vacuum chamber (fig. 2, [1]); and a power coupler configured to deliver power to rotatable tube (p. 1, para 0017-0018), the power coupler

(fig. 2, [9], [22]-[23]), with a current limiter [23], positioned between the bearings (fig. 2, [16]-[17]) and the seal (fig. 2, [13]).

With respect to claim 3, Wurczinger further discloses the system comprising the rotatable tube and shaft are integrated (fig. 1, [2]-[3]).

With respect to claim 5, Wurczinger further discloses the system comprising a drive system (fig. 2, [18]) configured to rotate the shaft (fig. 2, [3]) (p. 1, para 0017).

With respect to claim 9, Wurczinger further discloses the system wherein the power coupler is positioned outside the vacuum chamber (fig. 2, [1], [9]).

With respect to claim 10, Wurczinger further discloses the system wherein the power coupler comprises a water-cooled slip (fig. 2, [9], [23]; fig. 3, [4]). Wurczinger further depicts fig. 3 having an inner body [25] of the target tube with cooling conduit inflow [4] and outflow [5] running through the inner body according to fig. 4.

With respect to claim 12, Wurczinger further discloses the system comprising a support positioned inside the vacuum chamber, wherein the rotatable tube is continually supported by the support (fig. 3, [1]-[2], [10], [39]; p. 2, para 0020). Wurczinger further depicts fig. 3 having an inner body [25] of the target tube with cooling conduit inflow [4] and outflow [5] running through the inner body according to fig. 4.

8. Claim 19 is rejected under 35 U.S.C. 102(b) as being anticipated by Toki (Japanese Patent No. 01305523).

With respect to claim 19, Toki teaches a bearing for pivoting an electrode (i.e. cathode/target) rotating in vacuum to provide conduction of high frequency power supply to the electrode (i.e. cathode/target) (abstract). Toki also discusses an

electrically conductive liquid used as a connection terminal between the electrode (i.e. cathode/target) for the high frequency power (abstract). Toki further states that mercury is used to electrically connect the electrode and the case, thus making the mercury a liquid-metal connector. Furthermore Toki teaches the mercury (i.e. liquid-metal) connector is filled in the bearing case (i.e. shaft) that contains a bearing for pivoting an electrode (i.e. cathode/target) rotating (i.e. rotatable tube) (abstract). Mercury has a known resistivity of approximately $9.58x10^{-7}\Omega m$. Therefore, the mercury will automatically limit the current at a certain point due to inherent properties.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 2, 6, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (WO 03080891), equivalent to Wurczinger (USPGPub 2005/0178662), as applied to claims 1 and 13 above, and further in view of Barret (US Patent No. 6,736,948).

With respect to claims 2 and 15, the reference is cited as discussed for claims 1 and 13. However Wurczinger is limited in that while it does disclose transferring power into and out of the vacuum chamber and through the cathode [2] (p. 1, para 0018), it

does not state whether a power coupler is placed outside or inside the vacuum chamber.

Barrett teaches a cylindrical magnetron for sputter deposition with a drive system designed to operate with a high capacity electrical transfer system (abstract; col. 3, lines 52-57). Barrett further teaches transferring electrical power to and from a rotating target at the high levels required (col. 2, lines 14-16). In order to sputter effectively the targets must be in a vacuum environment as is well known in the art and exemplified in Barrett (col. 11, lines 32-34). Therefore the power coupler is inside the vacuum chamber. By transferring the electrical power within the device to rotating components, the undesirable effects of heat generation are better controlled and minimized at dynamic locations (col. 4, lines 6-9).

It would have been obvious to one of ordinary skill in the art to place the power coupler inside the vacuum chamber as taught in Barrett for the apparatus in Wurczinger in order to gain the advantages of increased control and minimization of negative heat generation characteristics and one of ordinary skill would have a reasonable expectation of success in making such a modification.

With respect to claim 6, Wurczinger is limited in that while it discloses using bearings on the shaft (fig. 2, [3], [16]-[17]; fig. 1, [3]), it does not describe the composition of the bearings.

Barrett further teaches a cylindrical magnetron for sputter deposition with a drive system designed to operate with a high capacity electrical transfer system (abstract; col. 3, lines 52-57). Barrett also teaches a bearing (part 334) being “a full ceramic bearing”

(col. 8, line 33) since "ceramic material has the advantage of being non-conductive, which means it will not heat up due to AC induction resulting from the current flow" (col. 8, lines 34-36).

It would have been obvious to one of ordinary skill in the art to compose the bearings of ceramic material taught in Barrett for the bearings in Wurczinger in order to gain the advantages of imperviousness to heat due to electrical conduction from current flow and one of ordinary skill would have a reasonable expectation of success in making such a modification.

11. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (WO 03080891), equivalent to Wurczinger (USPGPub 2005/0178662), as applied to claim 1 above, and further in view of Needham (US Patent No. 4,115,283).

With respect to claim 7, the reference is cited as discussed for claim 1. However Wurczinger is limited in that while it discusses using bearings on the shaft, it does not disclose the bearings being comprised specifically of ceramic needles.

Needham '283 teaches bearings known for antifriction composition (i.e. will not heat due to electrical conduction) (abstract). In addition to being composed of a variety of metallic materials, the bearings comprise about 15 to 25 weight percent of ceramic fibers (i.e. needles) (col. 1, lines 56-64). Needham '283 further states that these compositions are useful in a variety of applications such as journal bearings, bushings, ball bearing cages, and a variety of fittings, washers, seals, seats, wear rings, and the like (col. 4, lines 48-52). Ceramic material is also well known to be impartial to heating effects.

It would have been obvious to one of ordinary skill in the art to use ceramic fibers taught in Needham '283 as part of the bearing composition in Wurczinger in order to gain the advantage of imperviousness to heat and friction.

12. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (WO 03080891), equivalent to Wurczinger (USPGPub 2005/0178662), as applied to claim 1 above, and further in view of Tanaka (UK Patent Application No. 2,290,305).

With respect to claim 8, the reference is cited as discussed for claim 1. However Wurczinger is limited in that while it discusses using bearings on a shaft for a cylindrical magnetron (abstract; fig. 2, [3], [16]-[17]; fig. 1, [3]), it does not disclose the type of composition for the metal or metallic material bearing.

Tanaka '305 teaches a bearing alloy for use in oxidizing atmosphere, high-temperature applications (p. 1, lines 3-5). Tanaka '305 further teaches the alloy to be composed of, by weight, about 9 to 30% chromium, 2 to 22% cobalt, 1.4 to 11% molybdenum, and nickel composing a significant portion of the remaining alloy matrix (p. 1, 18-20; Table 1; Table 2). Tanaka '305 further discusses that a feature of the invention is " a combination of a bearing and a shaft, in which the bearing is formed of the bearing alloy" (p. 5, lines 5-7). Tanaka '305 discusses the advantages of using this alloy as excellent oxidation resistance and wear resistance while decreasing wear loss of the shaft for high-temperature applications (p. 5, lines 21-25).

It would have been obvious to one of ordinary skill in the art to use the bearing alloy taught in Tanaka '305 for the bearings in Wurczinger in order to gain the

advantages of excellent oxidation resistance and wear resistance while decreasing wear loss of the shaft for high-temperature applications.

13. Claims 11, 16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (WO 03080891), equivalent to Wurczinger (USPGPub 2005/0178662), and further in view of Toki (Japanese Patent No. 01305523).

With respect to claim 11, the reference is cited as discussed for claim 1. However Wurczinger is limited in that while it discusses a power coupler used to transfer power into and out of the vacuum chamber (p. 1, para 0018), it does not tell whether the power coupler is comprised of a liquid-metal connector.

Toki teaches supplying a high frequency power to electrodes (i.e. target), by a structure wherein a bearing case, which supports an electrode (i.e. cathode/target) to be rotated (i.e. cylindrical magnetron) in a vacuum vessel (abstract). An electrically conductive liquid is used as a connection terminal between the electrode (i.e. cathode/target) for the high frequency power (abstract). Toki further teaches that mercury is used to electrically connect the electrode and the case, thus making the mercury a liquid-metal connector. The advantage to using a mercury connector is power can be supplied to the electrode without being affected by abrasion of the bearing mechanism (abstract).

It would have been obvious to one of ordinary skill in the art to use the mercury connector taught in Toki as the power coupler in Wurczinger in order to gain the advantage of decreased resistivity, and thus decrease in loss of power, between the

bearing and the cathode and one of ordinary skill in the art would have a reasonable expectation of success in making such a modification.

With respect to claim 16, Wurczinger further discloses a system for coating a substrate (p. 1, para 0002) comprising a vacuum chamber (p. 1, para 0019; fig. 2, [1]), a rotatable tube positioned inside the vacuum chamber (fig. 2, [1]-[2]; p. 1, para 17), a shaft connected to the rotatable tube (fig. 3, [2]-[3]); a bearing positioned outside the vacuum chamber (fig. 2, [16]-[17]); a seal (fig. 2, [13]) positioned between the bearing (fig. 2, [16]) and the vacuum chamber (fig. 2, [1]); and a power coupler configured to deliver power to rotatable tube (p. 1, para 0017-0018), the power coupler (fig. 2, [9], [23]), with a current limiter [23], positioned between the bearings (fig. 2, [17]) and the seal (fig. 2, [13]). However Wurczinger is limited in that while it discusses a power coupler used to transfer power into and out of the vacuum chamber (p. 1, para 0018), it does not tell whether the power coupler is comprised of a liquid-metal connector.

Toki further teaches supplying a high frequency power to electrodes (i.e. target), by a structure wherein a bearing case, which supports an electrode (i.e. cathode/target) to be rotated (i.e. rotatable tube) in a vacuum vessel (abstract). An electrically conductive liquid is used as a connection terminal between the electrode (i.e. cathode/target) for the high frequency power (abstract). Toki further teaches that mercury is used to electrically connect the electrode and the case, thus making the mercury a liquid-metal connector. The advantage to using a mercury connector is power can be supplied to the electrode without being affected by abrasion of the bearing mechanism (i.e. shaft) (abstract).

It would have been obvious to one of ordinary skill in the art to use the mercury connector taught in Toki as the power coupler in Wurczinger in order to gain the advantage of decreased resistivity, and thus loss of power, between the bearing and the cathode and one of ordinary skill in the art would have a reasonable expectation of success in making such a modification.

With respect to claim 18, Toki further teaches the mercury (i.e. liquid-metal) connector is filled in the bearing case (i.e. shaft) that contains a bearing for pivoting an electrode rotating (i.e. rotatable tube) (abstract).

14. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (WO 03080891), equivalent to Wurczinger (USPGPub 2005/0178662), and Toki (Japanese Patent No. 01305523) as applied to claim 16 above, and further in view of Barret (US Patent No. 6,736,948).

With respect to claim 17, the references are cited as discussed for claim 16. However Wurczinger and Toki are limited in that while both discuss using a bearing to connect the shaft to the vacuum and to provide rotation (Wurczinger; fig. 2, [16]-[17]; p. 1, para 0018) (Toki; abstract), neither discusses the composition of the bearing.

Barrett further teaches a cylindrical magnetron for sputter deposition with a drive system designed to operate with a high capacity electrical transfer system (abstract; col. 3, lines 52-57). Barrett also teaches a bearing (part 334) being “a full ceramic bearing” (col. 8, line 33) since “ceramic material has the advantage of being non-conductive, which means it will not heat up due to AC induction resulting from the current flow” (col. 8, lines 34-36). Ceramic is well known to be an inorganic, non-metallic material.

It would have been obvious to one of ordinary skill in the art to compose the bearings of ceramic material taught in Barrett for the bearings in modified Wurczinger in order to gain the advantages of imperviousness to heat due to electrical conduction from current flow.

Response to Arguments

15. Applicant's arguments filed 6/10/2008 have been fully considered but they are not persuasive.

Prior Art

16. On p. 7-17, the Applicant argues that Wurczinger (USPGPub 2005/0178662) does not qualify as prior art.

The Examiner agrees with the Applicant. However the Examiner points to Wurczinger (WO 03/080891) as being equivalent, to Wurczinger (USPGPUb 2005/0178662), with Wurczinger (WO 03/080891) having a publication date of 10/2/2003.

102 Rejections

17. On p. 8-9, the Applicant argues that Wurczinger does not teach the power coupler positioned closer, measured along the axis of the shaft, to a center of the vacuum chamber than the at least one bearing.

The Examiner respectfully disagrees and submits the following: "a power coupler configured to deliver power to rotatable tube (p. 1, para 0017-0018), the power coupler (fig. 2, [9], [22]-[23]), with a current limiter [23], positioned between the bearings (fig. 2, [16]-[17]) and the seal (fig. 2, [13])".

18. On p. 15-16, the Applicant argues that Wurczinger does not teach an integrated rotatable tube and shaft. In addition, the Applicant argues that Wurczinger does not teach a drive system configured to rotate the shaft.

The Examiner respectfully disagrees. Wurczinger discloses in fig. 1 a tube cathode [2] and a connection fitting [3], with the tube cathode set into rotational motion by a driving unit [18] disposed in a connection fitting [3] (p. 1, para 0017). Fig. 2 also depicts the driving unit [18] rotating, thus even if the connection fitting [3] is supposedly not rotating, a shaft is inherently present and integrated with the tube cathode [2] to accomplish the rotational motion as described.

19. On p. 16, the Applicant argues that Wurczinger does not teach a power coupler cooled via water-cooled slip ring connector.

The Examiner respectfully disagrees. Wurczinger discloses in fig. 2 a cooling system [4]-[5] flowing past power coupler [23], thus the tube cathode [2] and power coupler [23] are simultaneously cooled.

103 Rejections

20. On p. 10-12, the Applicant argues that Toki teaches a pooled liquid mercury instead of the described liquid mercury bonded. In addition, the Applicant argues that it would not be obvious to combine the references Toki and Wurczinger.

The Examiner respectfully disagrees. The mercury being bonded to the contacts to form an electrical connection is not claimed, only the limitation of a liquid metal being used. In addition, liquid mercury is not capable of being 'bonded' in a typical sense since it is a liquid. As long as the liquid mercury forms an electrical contact with a conductor, the liquid mercury is technically bonded to said conductor in order to maintain said electrical contact. One of ordinary art would be motivated to use the liquid metal connector of mercury to decrease resistivity, thus gaining the advantage of maintaining a constant power provided to the sputtering apparatus.

21. On p. 13-15, the Applicant argues that Barrett and Wurczinger cannot be combined since Barrett would need to undergo significant modification to its design.

The Examiner respectfully disagrees. Wurczinger would undergo the simple modification of moving a power coupler, such as is seen in fig. 2, [22] to the inside of the vacuum chamber [1] instead of outside said vacuum chamber [1]. One of ordinary skill would be motivated to make this change to gain the advantages of increased control of the process and minimization of negative heat generation. Barrett does not need to undergo any modifications.

Conclusion

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Band whose telephone number is (571) 272-9815. The examiner can normally be reached on Mon-Fri, 8am-4pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

23. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. B./

Examiner, Art Unit 1795

/Alexa D. Neckel/

Supervisory Patent Examiner, Art Unit 1795